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Impact of Little Ice Age in central Anatolia: A stalagmite δ18O record from Yelini Cave (Günyüzü-Eskişehir, Turkey)

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Climate indicators such as tree rings, ice cores, glaciers, sediment layers and calcite precipitations (speleothems) have been climate sensitive and respond to centennial, decadal, annual and/or seasonal variations in climate conditions (Roberts, 2014; White 2011). Moreover, historical documents provide information on past climate events (Roberts, 2014). In this study, a δ18O record of a 230Th dated stalagmite from Yelini Cave (Günyüzü-Eskişehir), located in central-west Anatolia, is used to evaluate the past climate conditions. The age model of stalagmite reveals growth period between AD 1295-1875 years and this interval contains Little Ice Age (LIA, AD 1590-1850). LIA is characterized with freezing dry winters, cold and snowy weather, severe frosts and droughts period in Anatolia at the core of Ottoman Empire. Colder/cooler and less humid climate conditions in LIA have been defined as warming and cooling periods with severe winter, heavy snow precipitation, freezing, drought, famine, flood events and etc. in Empire's archive records. Temperature and precipitation fluctuations in LIA period affected Ottoman empire with unusually cold and variable climate conditions. These climate fluctuations were the cause of Great Drought (started $\sim$AD 1590, longest drought and freezing winters in the past 600 years), Celali Rebellion (AD 1595-1610, largest rebellion in Ottoman history) and Maunder Minimum (AD 1645-1715) periods in Ottoman empire (White, 2011). The impact of LIA fluctuations is seen as positive isotope trends in stalagmite δ18O record. The more positive δ18O (-5.86 ‰ VPDB) and more negative (-8.12 ‰ VPDB) isotope values correspond to Maunder Minimum time interval on AD 1697 and AD 1659, respectively. According to tree-ring records of Aegean Region, the year AD 1699 is characterized with severe cold and drought winter in central and west Anatolia (White, 2011). In AD 1686-1687 severe snow and drought conditions also were recorded as relatively more positive δ18O values in stalagmite. Drought, freezing dry winter and famine conditions were dominant during the Celali Rebellion period in AD 1607. During the LIA, freezing of Bosphorus Strait are recorded as more than one and more positive δ18O trends in AD 1621 and AD 1650 which correspond to serious droughts in Ottoman Empire. Besides the Ottoman archive records, Nar Lake sediment isotope records reveal also the dominance of LIA conditions in Anatolia after AD 1590 (Roberts, 2014).

White (2011), The climate of rebellion in the early modern Ottoman Empire, Cambridge University Press, 123-227. Roberts (2014), The Holocene: An environmental history, School of Geography, Earth and Environmental Sciences Plymouth University, UK, 277-323.